Case Report

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Thrombotic Occlusion of Stent Graft Limbs due to Severe Angulation of Aortic Neck in Endovascular Repair of Abdominal Aortic Aneurysm

Minsu Kim, MD[1,2], Myeong Gun Kim, MD[1,2], Woong Chol Kang, MD[1,2], Pyung Chun Oh, MD[1,2], Ji Yeon Lee, MD[2,3], Jin Mo Kang, MD[2,4], Wook-Jin Chung, MD[1,2], and Eak Kyun Shin, MD[1,2]

[1]Department of Cardiovascular Medicine, Gachon University Gil Medical Center, [2]Gachon Cardiovascular Research Institute, Gachon University, [3]Department of Anesthesiology, [4]Department of Vascular Surgery, Gachon University Gil Medical Center, Incheon, Korea

Endovascular aneurysm repair (EVAR) is a safe alternative to open surgical repair for an abdominal aortic aneurysm. However, unfavorable aortic anatomy of the aneurysm has restricted the widespread use of EVAR. Anatomic limitation is most often related to characteristics of the proximal neck anatomy. In this report, we described a patient with a severely angulated proximal neck who underwent EVAR, but required repeat intervention because of thrombotic occlusion of stent graft limbs. **(Korean Circ J 2016;46(5):727-729)**

KEY WORDS: Abdominal aortic aneurysm; Endovascular aneurysm repair; Graft occlusion

Introduction

Although endovascular aneurysm repair (EVAR) of abdominal aortic aneurysm (AAA) has been considered as an effective alternative procedure to surgical repair,[1)2)] an unfavorable aortic anatomy often restricts the indication of EVAR. Most manufacturers' instructions for use of the device recommend EVAR should be performed in patients with appropriate anatomic criteria. A severely angulated proximal aortic neck, one of the unfavorable anatomy criteria, might complicate the procedure, or increase the risk for late, device-related adverse events.[3-5)] We described a patient with a severely angulated proximal neck who underwent performed EVAR, but required repeat intervention because of thrombotic occlusion of stent graft limbs.

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Correspondence: Woong Chol Kang, MD, Department of Cardiovascular Medicine, Gachon University Gil Medical Center, 21 Namdong-daero 774 beon-gil, Namdong-gu, Incheon 21565, Korea
Tel: 82-32-460-3054, 8305, Fax: 82-32-469-1906
E-mail: kangwch@gilhospital.com

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Case

A 69-year-old male patient presented with abdominal discomfort. He had a history of hypertension and dyslipidemia. Computed tomography (CT) angiography showed fusiform dilatation of abdominal aorta (maximal diameter 7.5 cm) with severely angulated (108°) long (5 cm) proximal neck involving both common iliac arteries (Fig. 1A). For endovascular therapy, first, the right internal iliac artery was occluded with a 16 mm diameter Amplatzer vascular plug II (AGA Medical Corporation, Golden Valley, MN, USA). After that, we performed EVAR using a bifurcated stent graft. The main body (Endurant 28 mm×16 mm×166 mm, Medtronic Vascular, Santa Rosa, CA, USA) was percutaneously inserted through the right common femoral artery (CFA), which was preclosed using a two suture type closure device (Perclose, Abbott Vascular Inc., Redwood City, CA, USA). An additional stent graft (16 mm×124 mm) was implanted to extend the right stent graft limb to the right external iliac artery (EIA). In addition, two stent grafts (16 mm×124 mm; 16 mm×28 mm×82 mm) for the left limb were extended into the left common iliac artery (CIA), resulting in a flared iliac limb configuration. After a week of the procedure, a follow-up CT angiography demonstrated good patency of stent grafts without endoleak or graft limb occlusion (Fig. 1B). Each limb graft, however, was located at the level of a severely angulated aortic neck (Fig. 1B, white arrow and diagram). At 7 months after procedure, the patient suddenly complained of pain in the left lower extremity. The left lower extremity was cold and cyanotic, and pulses in bilateral femoral arteries were absent.

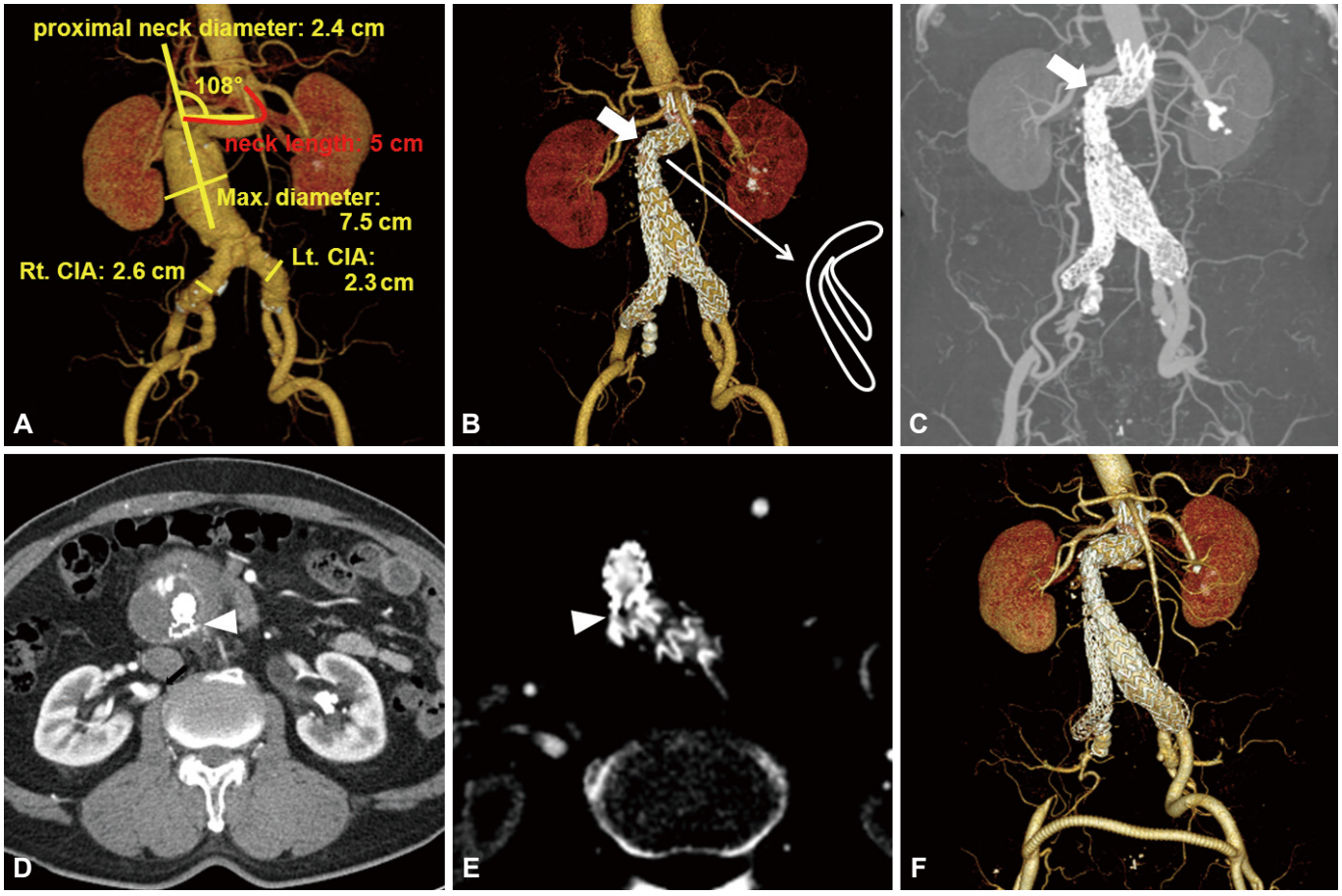

Fig. 1. CT angiography of severely angulated aorta. (A) CT angiography showed fusiform dilatation of aorta with a severely angulated long proximal neck. (B) After EVAR, a follow-up CT angiography demonstrated good patency of stent grafts without graft limb occlusion. Each limb graft, however, was located at the level of a severely angulated aortic neck (white arrow and diagram). (C-E) Seven months after the procedure, a CT angiography revealed kinking and inward compression of the right stent graft limb (arrowhead) with thrombotic occlusion of the right CIA. On contrary, the left stent graft limb was patent without any sign of kinking. However, distal embolization of thrombus was noted at the left EIA and CFA. (F) Emergent embolectomy and femorofemoral bypass were performed. A follow-up CT angiography showed good patency of the femorofemoral bypass graft. CT: computed tomograthy, EVAR: Endovascular aneurysm repair, CIA: common iliac artery, EIA: external iliac artery, CFA: common femoral artery.

CT angiography revealed kinking and inward compression of the right stent graft limb (Fig. 1D and E, arrowhead) with thrombotic occlusion resulted in total occlusion of the right CIA. On contrary, the left stent graft limb was patent without any sign of kinking (Fig. 1C to E). However, the left distal EIA and CFA were completely occluded. The patient has no history of atrial fibrillation or other disease-related coagulopathy.

Emergent embolectomy and femorofemoral bypass were performed. Thenceforth, an additional stent was implanted at the proximal kinking segment of the left stent graft limb. After the operation, limb ischemia was completely relieved and the patient was discharged without any complications. After 3 months of surgery, a follow-up CT angiography showed good patency of the left stent graft limb, left iliofemoral artery, and the femorofemoral bypass graft (Fig. 1F).

Discussion

As technical innovation progresses, EVAR has been gradually replacing open repair for the treatment of AAA.[6][7] In general, proximal neck anatomy is considered a major limiting factor for EVAR. In particular, implantation of stent grafts in a severely angulated proximal aortic neck can result in considerable technical problems during the procedures, such as access problems, accurate deployment, and proper fixation. Furthermore, a severely angulated proximal neck is associated with an increased risk of adverse aneurysm-related events.[3-5][7-9]

In our patient who had severely angulated proximal neck, EVAR was successfully performed without impeding procedures. However, occlusion of stent graft limbs causing acute limb ischemia occurred at 7 months after procedure. Recently, Faure et al.[10]

reported the incidence of and predictive factors for limb occlusions after use of the Endurant stent graft for AAA. The incidence of limb occlusion was 3.4% and the strongest independent predictors of limb occlusion were distal landing zone in the EIA, EIA of ≤10 mm, maximum aneurysm diameter of <59 mm, correction of endoleak, and kinking. Contrary to the cases included in the above study, the proximal limb rather than distal limb was kinked and occluded in this report. One possible explanation for the cause of the right stent graft limb occlusion is kinking of the proximal segment of the right stent graft limb because of severe angulation of the proximal aortic neck. There was no evident cause of the left stent graft occlusion, such as stent graft kinking. Thus, we hypothesize that the migration of thrombus from the kinked proximal right stent graft to the contralateral limb may have resulted in graft occlusion of the left side. The left stent graft limb, the contralateral limb, may not have resulted in kinking because two overlapped layers of the main body and contralateral limb were more resistant to kinking. Therefore, the expected position of each limb stent graft when it is deployed in a patient who has a severely angulated proximal neck should be considered for a successful EVAR. In a patient who has a long proximal angulated neck like our case, deployment of each limb stent graft below the angulated neck intentionally and adding a proximal cuff to cover the proximal land zone might prevent the stent grafts kinking or compressing.

In conclusion, unlike a usual limb occlusion case after EVAR for AAA, our case showed limb occlusion might have occurred because of kinking of the proximal graft limb deployed in a severely angulated long proximal neck.

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